

REMARKS/ARGUMENTS

Claims 5-7 are pending. Claims 1-4 have been canceled and Claims 5-7 have been substituted therefor. No claims have been allowed.

Responsive to the Examiner's rejection of Claims 1-4 under 35 U.S.C. § 112, second paragraph, Applicants have submitted new Claims 5-7 in view of the Examiner's objections regarding the overall form of the claims, the use of German words, and the use of the phrase "and/or".

Responsive to the Examiner's objection regarding the Specification under 35 U.S.C. § 112, first paragraph, Applicants have submitted herewith a Substitute Specification which is marked up to show the changes which have been made relative to the prior Specification. Applicants respectfully submit that no new matter has been added.

The Examiner rejected Claims 1-4 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 3,885,943 to Chui. (hereinafter "Chui '943").

Chui '943 discloses a method of cutting glass, shown in Figs. 1 and 2. A glass ribbon 10 is lifted from molten tin bath 12 within float chamber 14 onto sets of rollers 16, 18 and 28, 30, and 32. The glass ribbon 10 is at a temperature of 1,000° F to about 1,250° F upon exit from float chamber 14. At this temperature, the glass is subjected to a laser cutting operation using laser focusing structure 40, which is slidably movable upon channel beam 38 in a direction transverse to the long dimension of glass ribbon 10. The disclosure of Chui '943 notes that two "critical factors" exist for the cutting of glass ribbon 10 by the laser. (col. 4, lines 57-58). First, the beam spot size of the laser on the glass surface to be cut should be sufficiently wide such that, when the glass ribbon is cut, the resulting liquid glass on either side of the cut will have sufficient room to act under the forces of surface tension and be pulled into smooth rounded surfaces, whereby the rounded surfaces do not contact one another and reseal the cut. In this manner, the glass is cut completely through. (*see* col. 4, line 38 through col. 5, line 2). Second, the transverse velocity of the focus of the laser beam should not exceed a specified formula, identified at col. 4, lines 58-67.

New independent Claim 5 calls for a process for the production of bent glass and pre-stressed glass, including the steps of providing a crude glass plate; cutting through a portion of the thickness of the glass plate with a laser along a cut line; breaking the glass along the

cut line to provide a glass plate of a desired dimension; and subjecting the glass plate of the desired dimension to one of a bending and a pre-stressing operation.

Applicants respectfully submit that new independent Claim 5 is not anticipated by Chui '943 because Chui '943 fails to disclose each and every element of new independent Claim 5. Specifically, Chui '943 fails to disclose a process for the production of bent and pre-stressed glass, including the steps of cutting through a portion of the thickness of a glass plate with a laser along cut line, followed by breaking the glass plate along the cut line to provide a glass plate of a desired dimension, as called for in new independent Claim 5. By contrast, Chui '943 specifically teaches cutting a hot glass plate with a laser according to two "critical factors" of laser beam size and velocity, such that the glass plate is cut completely through, and newly-cut liquid glass surfaces about the cut do not contact one another and reseal. Thus, there is no disclosure, teaching, or suggestion within Chui '943 to one of ordinary skill in the art for cutting through a portion of the thickness of a glass plate with a laser, followed by breaking the glass plate along the cut line to provide a glass plate of a desired dimension.

Applicants therefore respectfully submit that new independent Claim 5 is not anticipated by Chui '943. Further, because Claims 6 and 7 each depend from new independent Claim 5, Applicants further submit that Claims 6 and 7 are also not anticipated by Chui '943.

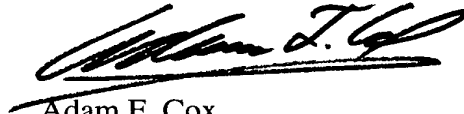
It is believed that the above represents a complete response to the Official Action and reconsideration is requested. Specifically, Applicants respectfully submit that the application is in condition for allowance and respectfully request allowance thereof.

In the event Applicants have overlooked the need for an additional extension of time, payment of fee, or additional payment of fee, Applicants hereby petition therefore and authorize that any charges be made to Deposit Account No. 02-0385, Baker & Daniels.

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Should the Examiner have any further questions regarding any of the foregoing, he is respectfully invited to telephone the undersigned at (260) 424-8000.

Respectfully submitted,



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Process for the production of prestressed or bent glass elements

PROCESS FOR THE PRODUCTION OF PRE-STRESSED
OR BENT GLASS ELEMENTS

BACKGROUND OF THE INVENTION

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TC 1700

1. Field of the Invention.

[0001] The invention relates to ~~prestressed~~ pre-stressed or bent glass elements, especially window panes.

2. Description of the Related Art.

[0002] ~~With prestressed glasses it is a matter, for example, of~~ Pre-stressed glass applications include glazing glass panes, of automobile glazings such as wind protection panes, of inlay bottom plates (~~Einlegeboden~~) for refrigeration cabinets, of inspection glass-windows for baking ovens, of spherical caps (~~Kalotten~~), of sanitary utensils, of instrument coverings, of special-filtering glasses, etc.

[0003] Flat glass panes that are then bent are currently being used ~~nowadays~~ for many purposes. A few uses are, for example, building glazing-panes, automobile glazings, spherical caps, sanitary utensils, instrument coverings, etc.

[0004] The process for the production of ~~prestressed~~ pre-stressed glass elements comprises the following process steps:

[0005] First of all the glass body, ~~thus, for example, such as~~ a pane of glass is produced. The float process is ~~usual~~ typically used to produce glass panes, but glass panes can also be generated in another manner, for example in the drawing process or in the casting process.

[0006] There then follows the cutting of the glass plates to measure for the required end measurement; following ~~upon~~ the cutting-to-measure, a processing of the edges is ~~indispensable~~ required. The edges, namely, present irregularities such as microcracks. On arising of tensions, such irregularities lead to a ~~braking-out~~ breaking out of glass in the edge zone or even to a propagation of the ~~microcracks~~ microcracks through the whole glass pane, and therewith to its breaking. For these reasons it is necessary to grind the edges of glasses before the ~~prestressing~~ pre-stressing, in order to avoid a breaking-out or breaking-through of the glass element in use.

[0007] Upon the edge treatment, in general a washing process must follow in order to remove the grinding residues of glass particles before the ~~prestressing~~ pre-stressing process.

[0008] The whole process is time consuming and ~~involves expensive payments of personnel~~. This relates especially to the edge processing and the washing treatment. The edge treatment ~~there~~ does not always lead to the desired result. After the cutting of the glass pane to the desired ~~measure~~ measurement, namely, hidden microcracks can be present, which extend relatively far into the glass surface, without this fact being perceptible in the edge process operation.

[0009] In the production of bent glass elements ~~nowadays~~, the following process steps are typically applied:

[0010] Preparation of the glass elements (ordinarily) produced in the float process; the plates may, however, also be otherwise produced, for example in the drawing process or casting process

[0011] Cutting of the glass plates to measure to the required final dimension

[0012] Edge treatment (grinding process, optional)

[0013] Bending process

[0014] Possible ~~prestressing~~ pre-stressing process (depending on glass thickness and utilization, a thermal or a chemical process)

[0015] The sense of the edge processing lies in an improvement of yield in the bending process, for the avoidance of breakage and glass splinters. If (which is possible) the edge processing is dispensed with, there results correspondingly an increased waste during that process. In addition to the edge processing mentioned, ordinarily there must take place,

before the bending process, a washing process for the removal of grinding residues and glass particles.

SUMMARY OF THE INVENTION

[0016] Underlying the invention is the problem of ~~giving~~ providing a process for the production of bent and/or ~~prestressed~~ pre-stressed glass panes, in which the disadvantages mentioned above are avoided. In particular, ~~it is to be achieved that the~~ present production process is simplified and less costly, and furthermore, the danger of the breaking-out or of the propagation of hair-like cracks is avoided. The process is in any case to be designed in such a manner that it is possible to dispense with an edge treatment and a washing process.

[0017] This problem is solved by the features of claim 1.

DETAILED DESCRIPTION

[0018] In this context, the inventors have perceived the following: When the cutting of the glass plate measured to its desired final measurement is carried out by means of a laser, then an edge quality is yielded which is faultless with respect to thermal and mechanical loadability. The quality is equal to that which is achieved with conventional edge processing. By the use of a laser all hair-like cracks or microscopic breakouts from the material are avoided. The grinding of the edges is thus dispensed with. ~~Therewith there is simultaneously eliminated~~ Simultaneously the necessity of the washing is eliminated. The saving in time and labor expenditure by the invention is, therefore, considerable.

[0019] Depending on the thickness (~~Starke~~) of the glass plate to be cut, it can be possible to achieve the desired dimension of the glass plate by a laser-scratching (~~Laserritzten~~) or scoring process and the subsequent breaking of the glass plate. Tests have shown that even here a faultless edge quality is achieved.

[0020] The use of lasers for the cutting of materials is known, to be sure. But it was not to be expected that the cutting of glass plates present here would render unnecessary a reworking of edges and therewith also (~~eliminate a~~) eliminate the necessity of washing. Without a knowledge of this factual behavior, the conventional process described at the outset had to appear more rational.

[0021] If a glass pane is to be ~~prestressed~~ pre-stressed, then by means of a laser ~~it~~ ~~respectively~~ after the laser-scratching and the pressing through, it is ~~prestressed~~ pre-stressed in a usual manner. There, the workpiece passes through a run-through furnace (~~Durchlauf-Ofen~~) or through a reversing furnace, and thereupon through a quenching arrangement. Here a pressure tension is applied in the outer zones, and in the inner zone a pull tension. The ~~prestressing~~ pre-stressing has, as is well known, the sense of enhancing the strength of glass panes and simultaneously, in the event of a breakage, to lead to a breakup of the glass pane into fine granules.

[0022] If a glass pane is to be bent, then by means of a laser it is cut to format. An edge treatment with the appertaining washing process is eliminated.

[0023] Glass panes produced according to the invention--bent and/or ~~prestressed~~ pre-stressed--have a clearly higher cut-edge quality and an increased strength. Bent glass panes have all the advantages of glass panes that are produced according to known bending processes, without the necessity of an edge processing.

[0024] The invention can be applied to any types of glass bodies, for example, to ~~complexly~~ complex bent glass panes, flat glass panes, and three-dimensional shapes.

[0025] The sequence of the process steps of "~~prestressing~~" "pre-stressing" and "bending" of the glass panes ~~can be in the on order or the other~~ may be varied. In general however, the bending will precede the ~~prestressing~~ pre-stressing.

ABSTRACT

The invention relates to a process for the production of ~~prestressed~~ pre-stressed and/or bent glass elements. In order to avoid an edge processing with subsequent washing, the process according to the invention is carried out as follows: a crude glass plate is produced; the glass plate is cut to the desired size; the cutting-to-size is done by means of a laser; and after the cutting-to-size the glass plate is ~~prestressed~~ pre-stressed and/or bent.